A COMBINED SET COMPRISING A LOAD TRANSFER PLATFORM AND A CARRIAGE

The present invention relates to a combined set, comprising a load transfer platform and a carriage for enabling a movement of said platform, said combined set comprising lift up means provided for lifting up and taking down said platform between an elevated position and a rest position, said carriage being removably applicable under said platform.

Such a combined set is known from EP-A 0 342 076. The known platform is used in cargo terminals or other stations where goods have to be handled. The use of the platform enables an easy transport of a large volume of goods generally of heavy weight. In order to move the platform over a floor, the platform is first lifted up and the carriage is shifted under the platform when the latter is in the lift up position. Once the carriage is brought under the platform, the lift up means are reset. The platform then rests on the carriage, enabling in such a manner a movement of the platform. Once the goods on the platform have been brought to their destination, the platform is again lifted up in order to remove the carriage.

A drawback of the known combined set is that no suitable storage is provided for the carriage when it is not applied under the platform. This could lead to the carriage being damaged or even lost. Damages at the carriage could on their turn lead to an inappropriate connection of carriage and wheelset and consequently to damaging the goods during movement of the set.

A further drawback of the known combined set is that during a movement of the platform, when resting on the carriage, the pulling force of for example a tractor is directly applied on the platform. This could cause stresses inside the platform and thus to damages to the platform.

It is an object of the present invention to provide a suitable storage of the carriage and to reduce the risks of damaging the platform during its movement on the floor.

For that purpose a combined set according to the invention is characterised in that said combined set further comprises a header unit provided for storing said carriage, said header unit being provided for being connected to a

tractor and comprises first connecting means co-operating with second connecting means applied on said platform for connecting said header and said platform during said movement of said platform when applied on said carriage. The header unit stores the carriage when the latter is not applied under the platform. In such a manner the carriage is protected. Since the header unit and the platform are connected together when the platform is moved on said carriage, the pulling force of the tractor is no longer directly applied on the platform but on the header unit. Consequently substantially less stresses are induced into the platform.

A first preferred embodiment of a combined set according to the invention is characterised in that said header unit comprises a power distribution station connectable to said carriage and said platform. In such a manner power is always available to the carriage and the lift up means.

A second preferred embodiment of a combined set according to the invention is characterised in that said header unit comprises alignment means provided for aligning said header unit and said platform with respect to each other. This enables to align correctly the header unit and the platform and thus a reliable connection between both.

Preferably said combined set is provided with a propulsion member provided for propelling said carriage from and towards said header unit. An easy movement of the carriage from and towards the header unit is thus obtained.

Preferably said header unit, said carriage and said propulsion member are provided with control means provided for controlling the travel distance of said carriage. In such a manner the carriage is correctly positioned under the platform and the platform can be moved in a reliable manner.

A third preferred embodiment of a combined set according to the invention is characterised in that said platform comprises a frame having a first set of longitudinally extending beams and a second set of transversally extending beams connecting the longitudinally extending beams together. This enables a modular building of the platform without affecting the solidity thereof.

Preferably said platform comprises first connection means provided to co-operate with second connection means mounted on said carriage, said first and

second connection means being provided for detachable connecting said carriage to a side of said frame provided to face a shop-floor by an up- and downward movement of said platform. This enables a connection of the carriage to the platform when the carriage is placed under the platform.

A fourth preferred embodiment of a combined set according to the invention is characterised in that it comprises an inflatable cushion mounted on said side-facing of said shop-floor. This enables an easy up- and downward movement of the frame.

A fifth preferred embodiment of a combined set according to the invention is characterised in that said beams of said first set comprise a substantially rectangular shaped hollow chamber extending over a substantially whole length of the beam, said chamber extending between a first and a second substantially U-shaped anchorage element, wherein said first and second anchorage element are provided for receiving a clamping unit which is provided for clamping said beams of said first and second set to each other. The rectangular shape enables a rigid construction of the frame whereas the anchorage element enables a strong connection of the beams forming the frame.

A sixth preferred embodiment of a combined set according to the invention is characterised in that said carriage comprises at least one wheel unit, each wheel unit comprises a first and a second wheelsubset pivotally and longitudinally mounted on a first carrying arm, which is pivotally mounted on a carrying element. This enables the carriage to easily ride over obstacles without affecting the load placed on the frame.

The invention will now be described in more details by means of the drawings illustrating a preferred embodiment of a combined set according to the invention.

In the drawings :

figure 1 shows an overall view of a combined set coupled to a tractor;

figure 2 shows a top view of a platform as part of a combined set according to the invention;

figures 3, 4 and 5 show respectively cross-sections along the lines III - III' - IV - IV', and V - V' drawn in figure 1;

figure 6 shows a cross-section through a connection member enabling to connect the profiles of the first and second set;

figure 7 shows the connection between the frame and the wheelset;

figure 8 shows a header unit as part of a combined set according to the invention;

figure 9 shows the connection of the header unit to the platform;

figure 10 shows a bottom view of a carriage; and

figure 11 shows a lateral view of an alternative embodiment of a carriage.

In the drawings a same reference sign has been assigned to a same or analogous element.

As shown in the overall view illustrated in figure1, the combined set according to the invention, comprises a load transfer platform 1 and a header unit 40. During movement of the combined set, the latter is pulled by a conventional tractor 71. Of course the tractor as such is not part of the present invention and is only used for pulling the combined set. The header unit 40 comprises a pulling member 41 provided to enable a coupling with the tractor. The coupling between the header unit 40 and the platform 1 will be described in more details hereinafter. For the sake of clarity only longitudinally beams of the platform are shown. However the platform also comprises transversal beams as will be described hereunder.

A carriage comprising a plurality of wheelsets 30 is removably applied under the platform and enables a movement of the platform over a floor or a road. When the platform is at rest, with or without load, the carriage is not applied under the platform but stored in the header unit as will also be described hereinafter.

The load transfer platform 1, illustrated in figure 2, comprises a frame having a first set of longitudinally extending beams 2, 3, 4 and 5. Those latter beams are connected by a second set of transversally extending beams 6 and 7, which also form part of the frame. At their lateral outside, the longitudinal beams are preferably provided with winches 8 to which straps, preferably nylon straps, can be attached for

fixing the load placed on top of the platform. The number of beams shown in figure 2 is of course only given by way of example and alternative embodiments with more or less beams are possible. The length of the longitudinal beams is preferably chosen in such a manner as to fit with standard lengths of containers.

Preferably the beams are made of a light-weight metal such as for example extruded aluminium. The use of extruded aluminium has the advantage that a light-weight and very rigid frame is obtained, enabling to carry heavy loads of several tons. However other materials such as steel, carbon fibres or wood could also be used depending on the charging capacity of the platform and the manufacturing price. Further a floor, for example made of wood or dedicated support elements such as for example a V-shape for the transport of coils, could be applied on top of the platform.

Each of the longitudinally extending beams 2, 3, 4 and 5 shows an open side 42 giving access to a substantially rectangular shaped hollow chamber inside the beam. This open side 42 is part of second means co-operating with first connecting means 43 (figure 8) applied on said header unit and provided for connecting the platform with the header unit.

As is illustrated in figure 3, which shows a cross-section along line III - III', the longitudinal beam 5 comprises the central substantially rectangular shaped hollow chamber 9, extending over substantially the whole length of the beam. This chamber extends between a first 10 and a second 12 substantially U-shaped anchorage element. The first anchorage element 10 extends over approximately one third of the height of the beam and is situated on a top side thereof. The second anchorage element 12 extends over the whole height of the beam.

Each of the first and second anchorage elements are provided with first protruding lips 14 applied on top of the U-shape and having an oblique angled extremity faced inwards the U-shape. Inside the U-shape a clamping unit 11, 13 can be inserted, which can be pulled against the protruding lips. Of course the dimension of the clamping unit is adapted to the one of the anchorage element in which it is applied. The clamping unit 11 is provided with one hole 15, whereas the

clamping unit 13 is provided with two holes 15. Each of the holes being preferably provided with a screw thread for receiving a screw as will be described hereinafter.

According to a first preferred embodiment, the first anchorage element 10 is further provided with a second protrusion 16 situated adjacent the first protrusion 14. This second protrusion 16 creates a cavity 17 with the outer wall of the chamber 9. The second protrusion lip forms second connection means mating with the first connection means applied on a carriage, as will be described hereinafter.

According to a second preferred embodiment of the platform, there is not such a second protrusion 16 creating a cavity 17. The first anchorage element 10 is provided with a substantially flat bottom part which preferably carries friction elements, for example made of rubber or a synthetic material with a high friction coefficient, at the places provided for contacting a carriage when the latter is placed under the platform.

The second anchorage element 12 is also provided for carrying the winches 8 as illustrated in figure 3. The winch comprises a drum 18 mounted on a plate 19 fixed with the anchorage element. The drum is provided to rotate and to be secured in order to fix the straps.

Preferably grooves 20 are applied on top of the longitudinal beams. Those grooves enable to insert a cushion element, preferably made of rubber, on which the load can rest. That cushion element exerts a friction on the load, thus reducing the possibility that the load could move when placed on the frame. Instead of grooves the upper side of the beam could also be provided with a rippled or slightly undulated pattern enhancing the friction between the beams and the goods placed on the platform.

At the underside of the longitudinal beam, a space 21 is provided to apply an inflatable cushion 22, preferably held by a plurality of ribbons (not shown). The inflatable cushion enables to lift up the platform from a rest position towards an elevated position when compressed air or gas is blown into the cushion 22 and to get access to the bottom of the platform. The profiles 23 at the bottom of the beam are also provided with grooves 24 for inserting further friction increasing elements for example made of rubber in order to enhance the friction between the platform

and the ground, when the platform rests on the ground. Instead of using a separate profile, as shown in the drawing, the profiles could be extruded simultaneously with the rest of the beam and form a whole.

Figure 4 shows a cross-section along a line IV - IV' (figure 2) of the transversal beams 6 belonging to a first subset. Preferably those beams have a dimension in cross-section of 60 x 80 cm. The beams 6 of this first subset have a substantially H-shaped pattern, provided on both lateral sides with substantially U-shaped third anchorage element 25. The third anchorage elements have a comparable shape to the one of the first anchorage elements 10, but have a lesser depth. The third anchorage elements are also provided for receiving a clamping unit 11. As shown in figure 2, the beams of the first subset extend between the beams 2 and 3 respectively 4 and 5.

Figure 5 shows a cross-section along a line V - V' (figure 2) of the transversal beams 7 belonging to a second subset. Preferably those beams have a dimension in cross-section of 60 x 160 cm. The beams 7 of this second subset have a shape according to a pattern formed by a juxtaposition of two substantially H-shapes. As shown in figure 4, the two H-shapes are in fact formed by two superposed beams of the first subset, although extruded during a same extrusion process. The beams of the second subset have thus comparable properties to the one of the first set and will therefore not be described in more detail.

Figure 6 shows a connection member 26 provided to connect the first and second sets of beams together. The connection member is substantially L-shaped and provided with three holes 27, 28 and 29. The short leg of the L-shape has one hole, whereas the long leg has two holes. Upon connecting a longitudinal beam, for example beam 2, with a transversal beam 6, the short leg of the connection member 25 is placed along the beam 2 so that hole 27 faces the first anchorage element 10 and is aligned with hole 15. The long leg is placed along the beam 6, so that holes 28 and 29 face the clamping units 11 inside the third anchoring element 25. A bolt is passed through hole 27 in order to penetrate into clamping unit 11 placed on the first anchorage element 10. Bolts are passed through the respective holes 28 and 29, in order to penetrate in clamping unit 11 placed in the third anchorage elements.

By tightening the bolts in the screw threads of the clamping unit, the beams are connected to each other. As the clamping units are preferably of rectangular shape, they will turn inside the anchorage element so as to block themselves. The oblique angled points of the protruding lips 14 will also cause somewhat penetration into the clamping unit when the latter is pulled towards the lips due to the tightening of the bolts and the nuts.

For connecting the longitudinal beams 3 and 4 with the transversal beams 7 of the second subset, the connecting member 26 is also used. However now two such connecting members are used in such a manner that a first one is connected with the upper part of the double H-shaped beam and a second one with the under part. The connecting members face each time one of the holes provided in clamping unit 11. Just as with the connection of the beam 2 with the first subset, bolts and nuts are used. The connection of the beams with each other is illustrated in figure 6.

By using the double shaped H (second subset) in the central axis of the frame 1 and the single shaped H (first subset), the strongest connection is obtained in the central part of the platform. This enables that the platform will not bend along its central axis due to a heavy load placed thereon. As the transversal beams 6 of the first subset have a longer length than the one of the second subset and as they are placed offset the central axis, they provide a good torque on the frame preventing in that way also a bending of the frame when heavy load is placed thereon. The use of the hollow chamber 9 also gives a strong rigidity to the transversal beams without causing the latter to have a heavy weight.

Figure 7 further shows how one of the wheelsets 30 which belong to the carriage is connectable to the frame 1. The second protrusion 16 mates with a further cavity 31 provided on top of a connection member 32 applied on an arm 33 of the wheelset 30. The cavity 17 applied on the first anchorage element 10 mates with the upper part 34 of the connection member 32 situated next to the further cavity 31. As the second protrusion 16 penetrates into the further cavity 31, a good connection is obtained. The gravity force takes care that the second protrusion 16 remains into the further cavity 31, as the wheelset 30 rests on a shop-floor 35 and the frame 1 is placed on the wheelset.

The wheelset is also detachably connected to the frame by the use of the connection member as shown in figure 7. As the second protrusion 16 simply engages into the further cavity 31 without any permanent connection, the wheelset can be easily disconnected from the frame. For this purpose the frame is lifted up from the shop-floor or the ground towards its elevated position, preferably by use of the inflatable cushion 22. However alternative lift up means could be used to realise the up- and downward movement between the elevated and rest position of the frame, such as for example a pneumatic jack. By inflating gas into the inflatable cushion 22, the frame is lifted up in such a manner that the carriage can be moved under the frame and brought to or from the connection means 16, 17. As the second protrusion 16 is situated at an upper side of the first beams, the up- and downward movement preferably remain limited to 10 cm at the most.

When the frame is lifted up, the wheelset can be brought under the frame and be adjusted so that the further cavity 31 is placed under the second protrusion 16. Releasing the gas from the cushion 22, will cause a downward movement of the frame and cause the second protrusion 16 to engage into the further cavity 31, whereas the top side 34 will engage into cavity 17. For removing the wheelset, it is only necessary to apply gas in the inflatable cushion and to lift up the frame in order to disengage the second protrusion and the further cavity.

When, according to the second embodiment, the platform is not provided with the second protrusion 16 but has a flat bottom plane, the wheelset does not have the further cavity 31. The upper part of the wheelset is then also provided with a flat top face, preferably provided with a friction element such as made of rubber or another synthetic material with a high friction coefficient. In this embodiment, the platform rests on the top of the wheelsets and the connection is done by friction between the carriage and the bottom of the platform when the carriage is applied under the platform.

The detachable connection of the carriage from the frame enables to apply the carriage on the frame only when necessary i.e. during transport of the platform from a storage place to a truck or train and vice versa. Once the platform is on the truck, train, boat or at the storage place, the carriage is removed and stored in the

header. The application of the carriage enables an easy movement of the platform without damaging the goods stored thereon, as all movements remain at the underside and without the need of a fork-lift truck. A reliable and easy transport of the platform is thus obtained.

Figure 8 shows a preferred embodiment of a header unit 40 according to the present invention. The header unit comprises a header frame having on a front end the pulling member 41 for connection to the tractor and on the back end a first connecting means 44 for connection with the platform. The first connecting means 44 comprises a locking member 45 for locking the header unit to the platform during transport. The locking member 45 is for example formed by a cylinder in which two locking pins 46 are mounted on a spring 47 as shown in figure 9. The locking pins 46 have oblique end faces for facilitating engagement with second connecting means provided at the longitudinal beams 3 and 4 of the platform. The locking pins are preferably pneumatically or electrically controlled in order to enable their disengagement.

The header frame further comprises alignment means, for example made by the protrusions 43, mounted on the back end. The alignment means are dimensioned and mounted in such a manner as to mate with the open side 42 of the longitudinal beams of the platform. When the header unit is placed in front of the platform, the alignment means are positioned in front of the open sides 42 and thereafter engaged into these open sides in order to penetrate into the hollow chamber 9.

The connection of the header unit is made by the first connection means on the header unit and the second connection means on the platform. As illustrated in figure 9, the second connection means are for example formed by two protrusions 48 applied on the longitudinal beams 3 and 4 of the platform. The protrusions are applied in such a manner as to face each other and are provided with a hole 49 or a flat side dimensioned in such a manner as to receive the locking pins 46. Upon engagement of the first connecting means into the second connecting means, the oblique ends of the locking pins get into contact with the protrusions 48. The movement of the header unit towards the platform causes the locking pins to be

pushed inside the cylinder 45 against the resilient force applied by the springs 47. When the locking pins 46 have reached the holes 49, they are pushed inside those holes by the reacting force of the springs, causing the locking of the header unit with the platform. For disconnection of the header unit, the locking pins are retrieved from the holes, for example by applying a pulling force on the springs 47.

The header unit further comprises two storage rooms 50 and 51 provided to store the carriage 30. For the sake of clarity only, two wheelsets belonging to the carriage are shown in figure 8, but it will be clear that each storage room can contain more than two wheelsets or even only one wheelset. The dimensions of the storage rooms is of course adapted to the number of wheelsets to be stored.

In figure 8, the storage rooms are presented as open rooms made by a tubular frame. However, it would also be possible to close the storage rooms and only leave one open end for the in- and output of the wheelset. The storage rooms are applied in such a manner on the header unit that, when the latter is in front of the platform, storage room 50 faces the space between the longitudinal beams 2 and 3 and storage room 51 faces the space between the longitudinal beams 4 and 5. In such a manner, the wheelset can directly be driven under the platform and brought under the respective longitudinal beams at lateral ends of the platform.

Each storage room 50 and 51 comprises a pivotable further platform 52 provided for carrying the wheelset stored in the upper floor of the storage rooms. Instead of using a pivotable further platform, the latter could be mounted on a lift up member. The further platform is connected on a rod 53 driven by a piston 54, 55, preferably a pneumatic or hydraulic piston. An up and downward movement of the rod, connected at an outer end of the further platform 52, causes the latter to pivot in such a manner that the further platform moves between a flat storage position and an inclined delivery position.

Each piston 54, 55 is connected with a power distribution station 60, provided for supplying power and control signals to the pistons. The power distribution station 60 is further connected with each of the drums 56, 57, 58 and 59. The drums carry each a flexible tube 61. The respective drums are connected by means of their respective flexible tube to a respective wheelset. So for example, the

flexible tube wound on drum 56, 57 is connected with wheelset 30a, 30b respectively.

The flexible tubes furnish driving power, for example compressed air or an hydraulic fluid, to the wheelset in order to enable a travelling of the wheelset from and to the header unit. That driving power is supplied by the power distribution station 60 to the different flexible tubes.

Before describing into more details the movement of the carriage from and towards the header unit, some more details of the carriage will be described.

Figure 10 shows the underside of one of the wheelsets 30 as being part of the carriage. The wheelset comprises preferably eight wheels 61 rectangularly disposed at the underside of the wheelset. Each wheel 61 is mounted on an axis 62 fixed to a support plate 63 which is mounted on a frame comprising tubes 64, 65, 67 and 68. The wheels 61 are freely rotatable around their respective axis 62 and are not connected to a power source. The rectangular disposition of the wheels is chosen in order to obtain an appropriate repartition of the load over the whole surface of the wheelset frame.

Each wheelset further comprises a propulsion member formed by a further wheel 69 and a motor 70 connected to the flexible tube 61 assigned to the respective wheelset. The propulsion member is displacably mounted on the wheelset in such a manner as to be displaced between a retracted and an operable position. For this purpose, the propulsion member is for example mounted on a vertical rack-gearing or on a pivot 71. When mounted on a rack-gearing, the propulsion member is moved downward for reaching the operable position where the further wheel contacts the floor or upwards, away from the floor, in the retracted position. In case of a pivot, the further wheel is pivoted from and towards the floor. The necessary power to displace the propulsion member is furnished via the flexible tube 61.

Once the header unit is aligned and connected with the platform, the latter is lifted up towards its elevated position by using the lift up means. The compressed air necessary to fill the inflatable cushion is supplied by the power distribution station 60. As soon as the platform has reached its elevated position, a control

signal is supplied to station 60 in order to indicate the latter. In the further description an automatic control of the lift up means and the carriage will be described. However a manual control could as well be applied.

When the platform is in the elevated position, the power distribution station activates the rack-gearing or the pivot of the wheelset 30a located at the ground floor of the storage rooms 50 and 51, in order to bring the further wheels 69 into their operable position. When the latter are in their operable position, the power distribution station activates the motors 70 in such a manner as to enable a forward movement of the further wheels. The wheelset 30 now starts their movement from the header unit towards the space under the platform. As the latter is in the lift up position, the wheelsets can freely move under the platform. The further wheels 69 and the wheels 61 now roll over the floor until the wheelsets 30 reach their predetermined position under the platform. During that movement, the flexible tube 61 is unrolled from the drum 56 and 58. The travel distance between the storage room and the predetermined position is controlled either by supplying power during a predetermined time to the motors 70, by the length of the flexible tube i.e. the length of the unrolled part is determined in such a manner as to correspond with the travel distance, or by using stop switches on the platform emitting a stop signal towards the station 60 when the wheelsets have reached their end position.

Once the power distribution station has established that the wheelsets 30a have reached their end positions, they supply a control signal and power to the pistons 54 in order to activate a movement of the rods 53. As the wheelsets 30a have now left the storage room, the further platforms 51 can pivot downwards under control of the movement of the rods 53. Once the front ends of the further platform 52 have reached the floor, the power station 60 will furnish power to the motors 70 of the wheelsets 30b stored at the upper floor of the storage rooms. The wheelsets 30b can in such a manner roll down from the further platform 52 and start their movement towards the platform in an analogous manner as the one described for the wheelsets 30a. The further platform is preferably brought back in its rest position in order to avoid a friction on the floor during a movement of the combined set.

Once all the wheelsets of the carriage are located under the platform, the compressed air is released from the lift up means, causing the platform to move towards the carriage and to rest on the latter. Thereafter the combined set can be moved by applying a pulling force by means of tractor 71 to the header unit. Since the latter is connected to the platform, which rests on the carriage, the header unit and the platform can be moved over the floor in order to bring them towards a predetermined destination. During this latter movement, the further wheels 69 are preferably in their retracted position as the pulling force is furnished by the tractor. The wheelset preferably roll then only by means of the wheels 61.

Once the combined set has reached its end destination, the platform is again lifted up to its elevated position in order to enable a retrieval of the carriage. Once brought in the lift up position, the power distribution station will again bring the propulsion member of the wheelset 30b to its operable position and activate the motor 70, now in reverse direction, in order to bring the wheelsets back to the header unit. An analogous operation as the one necessary to bring the carriage under the platform, is now performed. Once the wheelsets are again stored at the storage rooms, the lift up means are activated in order to bring the platform to its rest position.

In order to enable a large flexibility of movement to the wheelset and to travel over obstacles on a shop-floor such as bumps, the wheelset is preferably provided with a first 36 and a second 37 wheelsubset, as illustrated in figure 11. Each wheelsubset preferably comprises eight wheels i.e. two sets of four wheels. Wheelset 36, respectively 37, is pivotally mounted on a carrying element 40 and pivots around axis 38 respectively 39. The wheelsubsets are disposed in the longitudinal direction of the frame and extend perpendicular to the first set of beams. The carrying element is pivotally mounted on arm 33 and pivots around axis 41. The arm 33 belongs to the first connection means as shown in figure 7.

In such a manner the first wheelsubset 36 respectively the second wheelsubset 37 pivot around their respective axis 38 and 39, thus enabling them to pivot independently from each other. So regardless from which wheelsubset first reaches an obstacle, the pivoting movement will enable the wheelset to overcome

the obstacle without causing a torque inside the frame. The pivot axis 41 enables a transfer of the pivoting movement of one of the wheelsets to the other while taking care that the platform does not suffer from the abrupt movements. The two parallel pivot axes 38 and 39 enable that the wheels stay in contact with the floor during the travelling of the platform.

Preferably the wheelset is stored in a storage unit 42 shown in figures 8 and 9. The storage unit comprises two superposed trailer sets 43 and 44 in order to store two wheelsets one above the other. The trailer sets 43 and 44 are pivotally mounted around axis 45 and 46 in order to facilitate the loading and unloading of the wheelsets.